



# The Postdigital-Biodigital Revolution

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## Introduction

Alexander J. Means is Chair and Associate Professor of Educational Foundations at the University of Hawai'i at Manoa. He studies education in relation to political, economic, cultural, technological, and social change. His most recent book is *Learning to Save the Future: Rethinking Education and Work in an Age of Digital Capitalism* (2018).

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research addresses contemporary educational assumptions through philosophy, cultural studies, and pop-cultural critique. She currently uses new materialism to explore how sensations can generate open-ended pedagogies and circumvent constrictive approaches to the body in education. Her work has appeared in *Childhood, Science Fiction, and Pedagogy: Children Ex Machina* (Kupferman and Gibbons 2019), *Policy Futures in Education*, and *Educational Philosophy and Theory*.

Petar Jandrić is Professor at the Zagreb University of Applied Sciences, Croatia, and Visiting Professor at the University of Wolverhampton, UK. Petar's research interests are at the postdisciplinary intersections between technologies, pedagogies, and the society, and research methodologies of his choice are inter-, trans-, and antisciplinary. He is the Editor-in-Chief of *Postdigital Science and Education* journal and book series.<sup>1</sup> His recent books include *Postdigital Dialogues on Critical Pedagogy, Liberation Theology and Information Technology* (McLaren and Jandrić 2020), *Knowledge Socialism. The Rise of Peer Production: Collegiality, Collaboration, and Collective Intelligence* (Peters et al. 2020d), and *The Methodology and Philosophy of Collective Writing* (Peters et al. 2021f).

Derek R. Ford is Associate Professor of Education Studies at DePauw. They have written seven books, the latest of which are *Encountering Education: Elements for a Marxist Pedagogy* (2022), *Marxism, Pedagogy, and the General Intellect: Beyond the Knowledge Economy* (2021a), and *Inhuman Educations: Jean-François Lyotard, Pedagogy, Thought* (2021b). In addition to serving as associate editor of *Postdigital Science and Education* and deputy editor of the *Journal for Critical Education Policy Studies*, Ford is also Editor of Liberation School and Education Department Chair at the Hampton Institute.<sup>2</sup> They also created and hosted the podcast series, *Reading Capital with Comrades*, available on all streaming platforms.

Michael A. Peters is Distinguished Professor of Education at Beijing Normal University and Emeritus Professor at the University of Illinois. He is the Editor-in-Chief (with Xudong Zhu) of *The Beijing International Review of Education* and Editor-in-Chief of *Educational Philosophy and Theory*. His interests are in education, philosophy, and social policy, and he is the author of over 100 books. He has recently published *The Chinese Dream: Educating the Future* (2019), *Wittgenstein: Anti-foundationalism, Technoscience and Philosophy of Education* (2020a), *Wittgenstein, Education and the Problem of Rationality* (2020b), *Moral Education and the Ethics of Self-Cultivation: Chinese and Western Perspectives* (Peters et al. 2021g), *The Methodology and Philosophy of Collective Writing* (Peters et al. 2021f), and is working on a book about civilizational cultures in a multipolar international system.

Sarah Hayes is Professor of Higher Education Policy in the Education Observatory at the University of Wolverhampton, UK. Previously Sarah worked at Aston University, where she led programs in Education and Sociology and is now an Honorary Professor. Sarah has also taught at the University of Worcester, at international partner institutions, and has led a range of research projects. Sarah's research spans sociology, education and policy, technological, and social change and she has published in a variety of related journals. Her recent books include *The Labour of*

<sup>1</sup> See <https://www.springer.com/series/16439>. Accessed 1 July 2022.

<sup>2</sup> See <https://www.liberationschool.org/> and <https://www.hamptonthink.org/>. Accessed 1 July 2022.

*Words in Higher Education: Is it Time to Reoccupy Policy?* (Hayes 2019) and *Postdigital Positionality: Developing Powerful Inclusive Narratives for Learning, Teaching, Research and Policy in Higher Education* (Hayes 2021). Sarah is an Associate Editor for *Postdigital Science and Education*.

## About the Conversation

This article is based on a conversation between Alex, Amy, Petar, Derek, Michael, and Sarah conducted online on July 16–17, 2022 for Collective Intellectualities podcast led by Alex Means and Amy Sojot.<sup>3</sup> The conversation revolves around themes and insights covered in two edited books recently published in the Postdigital Science and Education book series: *Bioinformational Philosophy and Postdigital Knowledge Ecologies* (Peters et al. 2022) and *Postdigital Ecopedagogies: Genealogies, Contradictions, and Possible Futures* (Jandrić and Ford 2022).

The conversation transcript has been slightly expanded and edited for sense, clarity, and intended meaning. All authors have equally contributed to the conversation and the order of authorship follows the order of appearance.

## The Postdigital-Biodigital Revolution

**AM:** Petar, you co-edited both books that we are discussing today. Please outline the main sources of inspiration for these books; how did they emerge?

**PJ:** I was trained as a physicist, and I never gave much thought to biology. Yet in early 2020, when the Covid-19 pandemic started, I instinctively reacted by inviting the Postdigital Science and Education community to respond to the pandemic. I am proud to say that *Postdigital Science and Education* is amongst the first academic journals in the world that launched such a call, and the call resulted in a large collection of very successful articles.<sup>4</sup> Editing and co-authoring some of these articles turned my attention to relationships between biology, information, and society (Jandrić 2021).

Soon after, Michael, Sarah, and I published a series of four articles in and around biodigitalism and postdigitalism (Peters et al. 2021a, b, c, d). I felt that we were on to something bigger than a few articles, so I suggested that we should co-edit a dedicated book. Our interactions, led by Michael, ended up with the title *Bioinformational Philosophy and Postdigital Knowledge Ecologies* (Peters et al. 2022).

I still felt that something was missing, notably relationships between these issues and education. Derek and I co-authored a paper entitled ‘Postdigital Ecopedagogies:

<sup>3</sup> See <https://podcasts.apple.com/us/podcast/collective-intellectualities/id1557175579>. Accessed 1 July 2022.

<sup>4</sup> See *Postdigital Science and Education*, 2(3), <https://link.springer.com/journal/42438/volumes-and-issues/2-3>. Accessed 1 July 2022.

Genealogies, Contradictions, and Possible Futures’ (Jandrić and Ford 2020), and soon after we decided to co-edit a book by the same name.

These two books explore our postdigital-biodigital reality from slightly different perspectives and with different focuses. They are edited by different people, and they have different contributors. Yet I see these two books, in a way, as one large book.

*Bioinformational Philosophy and Postdigital Knowledge Ecologies* (Peters et al. 2022) presents a cross-disciplinary overview of critical issues at the intersections of biology and information science. Based on theories of bioinformationalism, viral modernity, the postdigital condition, and others, the book explores two interrelated questions: Which new knowledge ecologies are emerging? Which philosophies and research approaches do they require?

*Postdigital Ecopedagogies: Genealogies, Contradictions, and Possible Futures* (Jandrić and Ford 2022) conceptualizes ecopedagogies as forms of educational innovation and critique that emerge from, negotiate, debate, produce, resist, and overcome the shifting and expansive postdigital ecosystems of humans, machines, non-human animals, objects, stuff, and other forms of matter. Contemporary postdigital ecosystems are determined by a range of new bioinformational reconfigurations in areas including capitalism, imperialism, settler-colonialism, and ontological hierarchies more generally. Postdigital ecopedagogies name a condition, a question, and a call for experimentation to link pedagogical research and practice to challenges of our moment.<sup>5</sup>

**AS:** You mentioned that the books are conceived within the Covid-19 pandemic. Can you speak about the pandemic’s influence in the development of each text?

**DF:** For me, one of the most interesting things about the initial onset of the pandemic in early 2020 was the absence of a radical break that you might expect. In academia, things actually proceeded. There were obviously radical shifts and disruptions, but defences proceeded, publications proceeded, conferences proceeded, recruitment proceeded, departmental meetings proceeded, and degrees were conferred. For me, that was really evidence that we are in a postdigital era, and that what we are doing here is not just theoretical exploration. It is only in such a post-digital ecosystem that this intense global massive disruption is not that much of a disruption in so many ways.

**MP:** One of the tasks for this conversation should be to make a clear idea of what biodigitalism means and what postdigital means. For me, postdigitalism means quantum technologies. Have we moved into that era? Yes we have, but only just. So when you look at quantum supercomputing, the Oak Ridge National Laboratory (US Department of Energy) with its computing project<sup>6</sup> becoming the world’s fastest supercomputing, breaking the exascale performance barrier.<sup>7</sup>

<sup>5</sup> These descriptions are taken verbatim from publisher’s webpages: <https://link.springer.com/book/10.1007/978-3-030-95006-4> and <https://link.springer.com/book/10.1007/978-3-030-97262-2>. Accessed 1 July 2022.

<sup>6</sup> See <https://www.ornl.gov/exascale>. Accessed 30 August 2022.

<sup>7</sup> See <https://www.world-nuclear-news.org/Articles/US-supercomputer-breaks-exascale-barrier>. Accessed 30 August 2022.

Postdigitalism names the moment of historical transition, but we are at a very early stage of it. It is very difficult to see the outlines of this transition and we need to look beyond the emerging synthesis between synthetic biology on the one hand and information science on the other. To understand this transition, we need to examine its political economic consequences, the interlocking of boards of directorships between these new companies, and so on.

**SH:** For Petar and I, writing about postdigital for a lot of years felt as if we were writing a critique of the misunderstandings about the digital itself, driving reform in education (Jandrić and Hayes 2017). Such a position is often reflected in policy language about digital learning that claims automatic enhancements (Hayes and Jandrić 2014; Hayes 2018, 2019) but that renders human labour invisible. This discourse fails to recognise the complex and hybrid interrelations between humans as they work with, and encounter, the digital in their lives (see Jandrić et al. 2018). But this idea of biodigital was new to me, and I was not aware of it until invited to work with Michael and Petar on the four articles (Peters et al. 2021a, b, c, d) that ended up as chapters in *Bioinformational Philosophy and Postdigital Knowledge Ecologies* (Peters et al. 2022). As we experienced the pandemic sweeping through our different contexts, it revealed so many things to us, and at a pace.

Suddenly, here we were living at the intersections between biology, information, technology, and society, and this convergence we were writing about was such an important thing for me to notice. Partially because it did not seem to be recognized in the neoliberal political economic discourse in education, which is generally ‘counting on the use of technology to enhance learning’ (Hayes 2015). It felt as if we were having a powerful conversation in these articles that we were not hearing about in our institutions at all. I found myself full of questions. I had really liked the inclusivity aspect of the postdigital community, where anyone might contribute to help shape the messy notion of postdigital, via ‘postdigital dialogue’ (Jandrić et al. 2019). So I then began to wonder what a ‘biodigital dialogue’ might entail.

**MP:** It is a really novel concept and when you write appropriate keywords in your search engine you will come across the four of us and pretty much nobody else. Also the Canada Policy Horizons Unit did something on this,<sup>8</sup> which was very foresightful but also very much a state-oriented view that cut across a whole bunch of people, including indigenous people, about concerns around the control of life and life forms.

Biodigitalism goes back a long way and I think it is time to speak of nanotechnology, because nano (meaning one-billionth, or  $10^{-9}$ ) is the scale at which synthetic biology and supercomputing come together. I would like to mention just one area here: the biomolecular computational models in new computing. We are only on the cusp of that now. When you look at the financing, we are only talking about a few hundred million that are invested in this technology and related technologies (Leclerc et al. 2022). So it is not the leading edge of the postindustrial economy yet, but it is getting there. When you compare China and the USA, you will see a huge

<sup>8</sup> See <https://horizons.gc.ca/en/2020/02/11/exploring-biodigital-convergence/>. Accessed 20 August 2022.

investment that the Chinese have made in supercomputing; America has been left behind (Waters 2022). This is not just a strategic development technology. It is also about security, has to do with the military and surveillance, and a whole range of other issues.

We are the avantgarde of even talking about biodigitalism in relation to social science and pedagogy. I am really pleased to see *Postdigital Ecopedagogies: Genealogies, Contradictions, and Possible Futures* (Jandrić and Ford 2022), because we do not really consider the educational aspects of this. I would like to call this a revolution, but it is really been a long time coming. Quantum physics started around the 1920s and information theory of communication started in 1948 with Shannon's 'A mathematical theory of information' published in the *Bell System Technical Journal* (Markowsky 2022). Biodigitalism has developed slowly and I think that pedagogical consequences will also be slow to unfold. They are certainly there, but we are at such an early stage that it will take a long time to work out the details.

**AM:** Biodigitalism is the interface of biology and digital technology. You describe it as a new episteme at the intersection between *bios* and *technê*. Yet I am still a bit unclear on what all this means. Can you break biodigitalism down and outline its most important characteristics and consequences? Can you point to some specific biodigital technologies?

**MP:** Biodigitalism is not just about information technology and biology. It is the particular kind of biology at the nanolevel: synthetic biology, computational biology... That is only taken place in the last 10–15 years, so I think that we are doing a kind of futurology.

**PJ:** Let us place this into a historical perspective. According to Venter (2008) the twentieth century was a century of physics, meaning that the majority of scientific breakthroughs were deeply connected to theories and applications such as Einstein's relativity, quantum physics, nuclear technology, and so on. These breakthroughs were deeply connected to social development; probably the most obvious example being the Cold War. At the very end of the twentieth century, with the cloning of Dolly the Sheep at Edinburgh, mapping of human genome, and so on, biology has surpassed physics in terms of budgets, projects, and overall importance. Simply, biology is where things are happening at the moment.

Now what caused this major shift in importance? In *Bioinformational Philosophy and Postdigital Knowledge Ecologies* (Peters et al. 2022) we attribute it to various convergences. One important convergence is that of technology and science, or technoscience. The other is the convergence of *bios* and *technê*. And there are many others, so we placed all of them under the umbrella that we called the Great Convergence (see Peters et al. 2021a).

So biology has already taken primacy over physics a couple of decades ago, but only a few people (such as Michael) have noticed that—especially in the humanities and the social sciences. And then, bang! Within days, or months, the Covid-19 pandemic has brought this shift to everyone's attention. I admit that I did not see this coming. But now, the primacy of biology can be seen in various fields—bioeconomy, education, and so on—and with huge social impacts. Although, sadly, Putin (2022) is trying to bring back physics with his threats of nuclear war...

## The Politics of Development

**AS:** Some people would say, that is just science fiction! But you are saying that this is our reality... What are its main contradictions?

**SH:** In terms of social impacts, I want to speak about who is (not) included in this kind of knowledge and the realities for those who do not, or cannot, participate. We may have conversations in universities and research centres yet there are many people, globally and just down the road from my house even, who simply do not have the capacity to join debates on biodigitalism, even as their lives are affected by it. This is not simply about access to devices, networks, and infrastructure though; it concerns also what we now might broadly think of as ‘data’, and what it means for human bodies to be recorded by it anywhere, to generate it anywhere, and to interact with it (knowingly or not) anywhere (Hayes et al. 2021). The convergences taking place in each of our postdigital-biodigital realities bring new forms of disadvantage, even as many agencies seek to reduce an ongoing ‘digital divide’ (Van Dijk 2020).

For example, there has been a ‘blurring of the boundaries’, with practical, legal, and conceptual definitions of what counts as ‘health data’ (Ada Lovelace Institute 2020), but only some people may be able to resist who their health information becomes ‘legible’ to (Mortier et al. 2014). In the spirit of encouraging participation, partnership, and collaboration in debates on such issues of Human Data Interaction (HDI), in a forthcoming book in the PDSE book series, Hayes et al. (forthcoming 2022), have invited cross-sector chapter authors to help build new forms of postdigital-biodigital knowledge exchange. This exploration of the challenges and creative solutions that are being developed in the wider community is a basis for extending our understanding of HDI with what is postdigital-biodigital.

During the pandemic, we talked a lot about digital inclusion (see Jandrić et al. 2020, 2021, 2022a). But it is not enough in the case of the complex forms that biodigital data takes, right? So what kind of inclusion may we want to develop?

**DF:** It is a political question, and a postdigital one as well. As Marx and Engels say in *The German Ideology*, there is no such thing as a nature that is separate from the human (Marx and Engels 1970: 63). The real question is not about what is possible, are we gaining mastery over nature or whatever; it is really about in what interest do we produce nature? Who makes those decisions? How are those decisions made (Smith 2008).

Take the example of the smartphone. Its introduction was completely anti-democratic; it is not as if we never thought or discussed or voted upon whether we all want to be walking around glued to our screens. But here we are, all doing that. As a political organizer, I find this a useful agitational point to get people to think broadly about the politics.

**AM:** I think that the political questions that biodigitalism raises are deeply embedded in evolving historical processes of capitalist modernization. As Beck (1999) and others have outlined, the co-evolution and intersection of capitalism, science, and technology produces externalities, risks, and unintended consequences—some of which have catastrophic implications. I think that the

political question has to grapple with the integration of biodigitalism with these processes associated with global capitalism and the way catastrophe is externalised through the pursuit of endless expansion and accumulation, and then we need to ask what kind of political theory or critical philosophy is applicable to this reality. I have never heard of biological semiconductors that can store data. That ignorance of where technology is being produced and where it is headed, with little or no democratic input, is a pedagogical problem and it requires some sort of educational project as well as political project. How do these things intersect in your books?

**MP:** It is true that we have passed the point of what Kuhn (1970) might call ordinary science to revolutionary science. Social sciences have not gotten fully onboard yet and hats off to Petar for leading this kind of inquiry.

In my view this has got at least two components. One is the analysis and understanding of the way in which critical social science might proceed with this new bunch of concepts. As Sarah and Derek said, we are not consulted about the development of life-changing new technologies; there are many political questions. The other part is political economy focused on the companies leading these developments but also countries at the geopolitical level. Politically, biodigitalism is a determining force in the international arena between China and the USA, with governments pouring billions of dollars into them in order to gain some kind of ascendancy. To understand international politics, you really need to understand these emerging technology wars.

**DF:** Michael raises very important points. In 2018 the US Department of Defense has explicitly stated that terrorism was no longer a problem and that it was gearing up towards what they call ‘great power rivalry’, which if you read it, is the conflict with China (Ford 2019). The war between the US and China would be catastrophic, and we need to politically organize against it.

That is tied also to the link that you mentioned, Alex, between politics, pedagogy, and philosophy. Inspired by your book, *Learning to save the future: Rethinking education and work in an era of digital capitalism* (Means 2018), in the postdigital ecopedagogies book I wrote a chapter with some of my students (Ford et al. 2022). In the book (Means 2018), you speak of educational solutionism in which social problems are presented as nothing more than technological problems in need of technological fixes. We argue that, basically, it is about our senses. How do we sense the world, what do we make sense of, and what do we do with those sensations? What sense do we make out of them? Why is it that some things make sense and other things do not make sense? So when we talk about technological progress or advancement, I ask: Is that the right word? Is it actually an advancement or something different?

You write (Means 2018) about the need for a new mass intellectuality that can create a new map, like Jameson’s (1984) cognitive mapping. That is important, because if you read his early articles, they are about the fact that obviously in his era, and this was ca 1983, 1984, it is impossible for us to locate ourselves within the totality of global capitalism.

**AM:** You are speaking my language, Derek.



**DF:** Importantly, Jameson (1984) says, let us do it! We just have to understand that our locating will always be partial. But then there is the other thing—the crisis of international Marxism, at the time, was that there was not a map of what the future should look like. For me, developing utopia is the educational project. How can we help others? We can explain things, and that is very important, but how can we help people to literally experience the sensation that things do not need to be this way and that they can be radically different (Ford and Chapella, [in press](#))? That is the pedagogical task I am interested in, and the one that contributes to the political project.

## Postdigital Utopia

**AM:** Cognitive mapping is something that has been quite important to me as a basic diagram for thinking about history as a totality of integrated relationships. However, cognitive mapping is not about grasping totality itself, which is always too complex for any singular representation. That is the impossibility you speak of Derek. In contrast, cognitive mapping takes this impossibility as an object of meta-conceptualization, where one's location, subjectivity, and sense of meaning and reality, is understood as woven into and shaped by larger historical forces and conflicts immanent to global capitalism and its distinctive processes of accumulation and modernization. In terms of imagination, I would like bring this back to postdigital critical philosophy.

We just had Mark Featherstone with us last week [in *Collective Intellectualities* podcast] who wrote a book *Planet Utopia: Utopia, Dystopia, and Globalisation* (Featherstone 2017). He is concerned with a sense of nihilism among many young people. For Featherstone, this collapse of meaning within the society is a symptom of the failure of the neoliberal utopia, which is really a utopia premised on the end of all utopias. In the USA this manifests, for example, in mass shootings, in an attraction to reactionary politics, and in many other things. There is seemingly a pervasive sense of meaninglessness, hopelessness, and powerlessness.

I think that has a lot to do with the collapse of imagination that you are talking about, and that collapse of imagination involves a practical relationship with reality where power is rendered invisible and opaque. We are talking about biodigital innovations that are taking place in laboratories somewhere out of public view and without debate, probably funded by imperial money, within a global geopolitical context where a devastating catastrophic war is quite possible, say between the USA and China. Combined with climate change these things feel big, overwhelming, and abstract, and so it is very difficult to imagine what kind of action one can take, other than say doom scrolling or posting on social media. And as you say, there are forms of injustice, militarization, and ecological crisis that require collective rather than individual responses.

The word utopia comes up in both of your books, in relation to ecopedagogy and also to biodigital philosophy. How does utopia operate in these books and why is utopia important conceptually, pedagogically, and politically in this set of conditions?

**MP:** When you talk about the ability to make synthetic plants, or edit genes, or whatever, these technologies have the capacity to create a utopian story. A part of the utopian story is what sells a technology at a funding level. In America they are also very explicit about the military spinoffs, because if a technology does not have these spinoffs, then it is probably not going to get funded. But there is simultaneously the utopian element of bioeconomy: sustainability, the ability to choose synthetic futures, and so on. That seems hugely utopian, and yet it is science fact rather than science fiction. The downside of this is that the control over these technologies, for instance synthetic plant production, might revert to the likes of Monsanto. And we all know how Monsanto works!

In my bioinformational technology paper (Peters 2012) I called this bioinformational capitalism, because biotechnology was referring to a soft renewable basis for capitalism. Bioinformational capitalism is not based on the old factors of production. Here is a different kind of economy; one that creates its own basis. That is a radical concept.

In the capitalist system, particularly the US capitalist system, there are very few controls. We get to learn the ecological consequences of new technologies years and years later, when the damage has already been done. That is got to be a part of the critical biodigital philosophy; we have got to look at both the political economy and the politics.

**AS:** That capitalist standpoint is an anti-democratic project—so whose utopia is being envisioned?

**AM:** The utopia of the National Science Foundation is one of endless mastery and expansion. It is the utopia of space colonization and asteroid mining. Meanwhile this planet is increasingly imperilled.

**AS:** And these advances in technology come at a cost to the environment and to people!

**MP:** There is also another utopia, the utopia of open science (Peters and Roberts 2011), particularly coming back to Covid-19. The Chinese shared Covid virus genome very quickly and even the major publishers abandoned their paywalls, allowing quick progress on virus control and virus recognition and its mutation. Petar, you wrote a paper on that...

**PJ:** I did (see Jandrić 2020a, b)—and we expanded these insights in our papers with Peter McLaren on viral modernity (Peters et al. 2020a, b, c, d). But I would like to take this argument elsewhere.

Over the years, we talked a lot about the role of postdigital intellectuals within the development of different critical utopias (Ford and Jandrić 2019; Jandrić and McLaren 2021; Peters et al. 2021a, b, c, d, e). But if you go back in time, for instance to the Second World War and the Manhattan Project aimed at development of nuclear weapons, you will see that in 1943, the world's best physicists blew up a small atomic reactor not more than a few kilometres from the small town where their families lived. Not enemies, not some anonymous test subjects—their own families. Why did they do that? At the time, obviously, they did not really know about the dangers of radiation, not in the same sense as today. For the same reason, Marie Curie died of the consequences of long-term exposure to radiation.

Towards the end of the Second World War, when the Manhattan project physicists realized what they created, they sent warning letters to the president and so on. But it was already too late—the USA threw two atomic bombs on Japan. Years later, the Cold War was based on the understanding that the nuclear war would likely destroy the whole planet, and even in the worst of crises, such as the Cuban missile crisis, world's leaders refrained from using nuclear weapons. Finally, kids all over the world started to learn in school about the dangers of nuclear power.

It was always first technology, then political regulation, and then, at the very end, education. This sequence is problematic, because as we all agreed, we are dealing with a pedagogical problem. One of the main problems with the pedagogical problem is that pedagogy always comes late.

To give a more recent example; these days there is a lot of talk in the EU and globally about regulation of Artificial Intelligence. People have been warning about AI-related issues at least for 20 years. And now, after so many examples AI-related problems have been identified, and after so many books and articles have been published, we are finally starting to regulate things—and that process is far from over. Issues pertaining to AI have still not entered most curricula (see Pasquale and Selwyn 2022).

In this and many other examples, scientific development precedes regulation and regulation precedes education. So the question is: How can we insert pedagogy into the very beginning of the discussion?

Utopia offers an opportunity to build pedagogy into the very core of technoscientific development; to replace reactive pedagogy, which follows trends, with proactive pedagogy, which starts trends. Utopian thinking, therefore, is one of the rare opportunities in which the social sciences and humanities can actually take the lead and not the other way around.

**SH:** We are in an economically driven society where the structure of our economy underpins everything. This becomes reflected in the language in which we speak and write about both technology and education, the policies we create (Hayes forthcoming 2022), and indeed the sequencing Petar describes. Much of our post-digital debate has drawn on the consequences emerging from this way in which our political economy is organised. Previously, in dialogue with Michael and Petar, I raised questions on alternative forms of political discourse:

[I]f our biodigital dialogue draws on bioeconomy, then, will we need to examine 'political bioeconomy' as a new, or extended field of thought, or alternative way that society is organised? How might this look beyond our current political economy? Having closely examined how policy discourse about technology has been shaped through political economy, to limit us within restricted instrumental approaches (Hayes 2015; Hayes and Jandrić 2014; Jandrić and Hayes 2017), I am interested in what new discourses and related behaviours might emerge through political bioeconomy. (Peters et al. 2021c)

My interest is in whether new sustainable green global resources could not only support new forms of political economy, but in turn help to replace a dominant discourse about how technology will automatically enhance experience (as if human experience were something universal that we all share). I am interested therefore in

new diverse forms of ‘political bioeconomic discourse’. I would love to think that a powerful political discourse might emerge at the intersections where biodiversity and human cultural diversity meet. This could help to reveal rich postdigital positionalities (Hayes 2021) from different contexts, rather than one global, assumed technology enhanced learning experience.

However here in the UK, we are rapidly closing down art, humanities, and social science courses where this kind of philosophical and practical thinking might actually happen. Instead of ‘the humanities’ being acknowledged for their importance across STEM, where we are exploring new forms of energy resources, and the arts, where we are celebrating cultural diversity, we seem to be reducing the capacity for generating alternative thinking for new forms of political economy, that could underpin both.

**PJ:** This is one important reason why we started the *Postdigital Science and Education* journal and book series—to create places where such thinking can happen!

**MP:** We need to emphasize that we are talking about Western society, because I do not find that to be the case in China. China is ancient philosophical culture, and really does pay a lot of attention not only to philosophy but also to social sciences. Recently I have been doing a couple of special issues on Chinese Marxism, and it is my view that the Chinese Marxist narrative is likely to become the main narrative displacing neoliberalism, at least for China.

I do not know if you heard this comment by Li (2013, 2021) that the only difference between Chinese and American capital is that the billionaires rule the White House, but they do not rule the Communist party. I think that is probably true, and I do not know whether it is a plus or a minus, but I do think that Chinese Marxism is a social science and a philosophy/ideology that the Western critical scholars really need to come to terms with, and in a big way. Of course there is a utopia there as well, but it may not be in accord with Western values.

**DF:** Based on Tyson Lewis’ work (Lewis 2010, 2012; Lewis and Kahn 2010), in ‘Postdigital Ecopedagogies: Genealogies, Contradictions, and Possible Futures’ (Jandrić and Ford 2020) we distinguish prophetic utopias from messianic utopias. Prophetic utopias, whether they are positive or negative, are about the future. Messianic utopias are about experiencing the alternatives that have been created, here and now. For instance, for most of human history we have not had capitalism. Capitalism is a very small blink in the trajectory of human history, and daunting problems that you are talking about, Alex, can indeed result in nihilism. But just as often, they result in a radical optimism and an embrace of the fact that we need revolutionary solutions to these problems.

If you ask young people in the USA, do you think socialism is better than capitalism, 51% will say ‘yes’, according to a 2021 poll (Wronski 2021). The Axios poll found that support for socialism amongst oppressed groups in the USA is even stronger, as 60% of Black people and 45% of women, for example, view socialism favourably (Salmon 2021). This is unprecedented for a place where anti-communism was almost an unofficial religion for decades, especially after the collapse of the Soviet Union, where the revolutionary possibility was heavily discredited.

That is now coming back into the people’s movements, where large numbers of very diverse populations are coming out in the streets for various causes. These are

all dress rehearsals for something larger, these are Utopian elements in the present, and I think that one of our main pedagogical tasks is to help people sense the possibility of revolutionary alternatives. I see a real hope there.

I was recently listening to Becker (2022) talking about Lenin's (1932) *State and Revolution*, which was written before the revolution of 1917. In 1916 Lenin is in exile in Switzerland. He is talking to a group of university students, and he says to them, I paraphrase, 'I'm not going to see a revolution in my lifetime. I'm organizing so that you'll see one in your time.' Less than a year later, Lenin is in a revolutionary government.

I think that our pedagogical task is to impart this sense of revolutionary possibility. There is a saying by Albie Sachs, the Jewish lawyer involved in the South African anti-apartheid struggle, that '[a]ll revolutions are impossible until they happen; then they become inevitable' (Sachs 1991: 21). A lot of Western critical theories have been really terrible about developing this sense of possibility, because they basically say is that the only dogma you can accept is that a revolution is impossible, or that it leads to terror, and the like. For me, the messianic utopian pedagogy is not just about teaching but about helping people experience alternative social formations in the present.

When Covid-19 happened, the US government was murderously negligent, but at the same time, people who would never done any organizing or even volunteering before started showing up and asking: How can I help my neighbours? That sort of critical utopianism is both pedagogical and opens up political possibilities. I guess it is also postdigital, and this is where I still struggle, because there is a big difference between what happens online and what happens offline.

Also things are very different in the USA, China, and Europe, but one of the promising developments all around the world is the rapid growth of alternatives in intellectual production and collaboration. The People's Forum in New York City, the Critical Theory Workshop, ... all of these that are really trying to move intellectual production out of the university and back into the people's movements.<sup>9</sup> To me, that is where the great sense of possibility lies, at least in the USA.

**MP:** I agree. What we have also seen in terms of political formation was the organization of the far right (Peters and Besley 2021); look at the abolition of critical race theory in so many US states now. So both sides are becoming more well organized. In New Zealand we recently had hundreds of protesters on the grounds of the Parliaments, supported by external funding, and really committed to overthrow the government (Spoonley 2022). I have never seen a thing like that before in New Zealand and I was part of the anti-Vietnam protests and so on. This is a different kind of protest! The university seems hopeless in these matters, yet I have not given up on the ability of the left to organize itself, particularly at the academic level through the concept of open science. That is why we wrote about knowledge socialism; I think that is where socialism as a Utopian concept goes (Peters et al. 2020a, b, c, d).

<sup>9</sup> See <https://peoplesforum.org> and <https://criticaltheoryworkshop.com>. Accessed 30 August 2022.

## Postdigital Knowledge Ecologies

**AS:** One of the ways to organize is through developing postdigital knowledge ecologies that may be more horizontal, more networked, and more relational. In both books you are trying to develop more democratic knowledge ecologies in a postdigital manner. What is the tension between these efforts and biodigitalism, especially in academic production? You say, for instance, that people want to publish articles, not chapters in edited books... Is biodigitalism making edited books obsolete?

**PJ:** Regardless of these trends, I would say that biodigitalism makes edited books more important than ever. I will give you a plain example. You meet someone and you like them. For two healthy people of opposite sex and fertile age, this encounter is likely to result in a child (in our postdigital-biodigital age, we also need to include various other scenarios such as *in vitro* fertilization, surrogate parenting, and so on). You know yourself; you know your significant other. Yet when you mix your genetic material, you can never anticipate whether your child will be short or tall, pale or dark, talented for mathematics, sports, or arts. This genetic lottery is only the beginning. You then need to educate your child, and most parents put a lot of effort in education. Yet the results are not less unpredictable, as children educated in the same way, even identical twins, will inevitably grow into different adults. Human reproduction and upbringing are messy businesses; this is what makes them so beautiful and hard at the same time.

An edited book is somewhat similar. I know myself, I know my co-editors, and I know our book's contributors. Some of our relationships resemble long marriages and others resemble one-night stands. Yet no matter how well we know each other, an edited book is always somewhat unpredictable. Issuing a call for chapters, we can never anticipate its results. We can give our best to authors during reviewing and production, which is the equivalent of human upbringing and education, but we cannot control the results. And once the book is out, it gets a life of its own.

Human reproduction, education, and upbringing is analogous to production of an edited book. It is not a product of one person, it is always a product of a group of people, who interact and produce something which is always unpredictable. Now the golden standard in most disciplines, at least in the humanities and the social sciences, is a single-authored journal article and a single-authored monograph. While there is some interaction with the editors and reviewers as well, the process of producing these articles and books is just very different from producing chapters and edited books (see Jandrić 2020a, b). Single-authored stuff is just much more predictable. Single-authored books and journal articles bring huge value, but that does not make edited books and their chapters less valuable. Like cats and dogs; they are two different species, based on two different principles.

In the age of bioinformation, edited books will surely not become obsolete. Based on this analogy, I would actually say that the genre of edited books suits the bioinformational age much better than the genre of a single-authored journal article or a single-authored book. But trends in academic publishing depend on so much more than characteristics of any genre, as relationships between centres of power and their margins shift constantly and unpredictably (Jandrić and Hayes 2019).

**SH:** I think that there is a value that is going on there between the co-authorship and editorial work that is invisible, but very intense. When you are editing the collections you are having dialogues constantly with each other and our little publishing experiment in *Bioinformational Philosophy and Postdigital Knowledge Ecologies* (Peters et al. 2022), amongst many others, shows the power of these dialogues. This work multiplies in ways that may not be changing the world overnight but I noticed that people wish to keep participating, despite the metrics and other things that are on their head for their careers.

So the concept of ‘knowledge ecologies’ that suggests that disciplinary boundaries are no longer firm or distinct, but fluid, seems key. Many of the publishing experiments and collective writing projects led by Michael and Petar are revealing the convergence driven by new biodigital technologies that can in turn ‘change the structure, substance and research methodologies of the fields in question’ (Peters et al. 2021d). If we are noticing the convergence of disciplines, and how this alters our perspectives on research and teaching, I wonder ‘how much some of our policies, as static texts not in dynamic and active use, remain grounded in the structure, but fail to travel to effect change across the infrastructure’ (Hayes 2021).

**MP:** I have been in academic publishing for about 25 years as an editor of *Educational Philosophy and Theory* and I started 10 academic journals internationally. We are in the grip of five multinational publishers which determine the form and the content of what is published. To a large degree, they insist on an industrial form that we have been taught to be slaves to and that is a part of a much broader system that works in synergy with ranking agencies, university research boards and so on (Peters and Jandrić 2018). The Chinese do not get in there so they are looking to do their own thing. So academic publishing is all distorted by political economy, by the ownership of it, by the ideology of performativity, publish or perish, and so on.

On top of that, we now see gems of new supercomputing technologies and beginnings of autonomous authorless science. There are plenty of journals out there that do not have editors; they just do continuous calls for papers. People who are doing that are also behind the wall, so you do not know who they are, what they are doing, or how they do it (Helgesson et al. 2022; Schulz et al. 2022). I am deeply pessimistic that anything can come through academic publishing.

**AM:** I really appreciate what Petar said about the unpredictability of collective authorship. There are no blueprints we can follow, yet I do not believe that we are powerless. That unpredictability, unfinishedness, and sense of capability and capacity is at the core of the critical pedagogy tradition. How is this tradition is being reworked in the ecopedagogies book?

Academic knowledge is a question of science; is it also a question of technology? Ivan Illich and Paulo Freire talked about technology and its implications for pedagogy but I do not think that your typical progressive educator in a typical college of education thinks very deeply about science and technology. I must also mention a categorical error, that I see being made constantly, which is the conflation of capitalism and science. They are not one and the same. And we need to be clear that science can be put in the service of exploitation as well as emancipation. New scientific capacities and literacies are crucial for any emancipatory agenda. I think this is a point that is too often ignored by progressive or radical educators. What are the new

ways that postdigital philosophies look at critical pedagogy? How do they intersect with utopian political imaginative possibilities, particularly in relation to ecological crisis?

**PJ:** I started my career in education doing EdTech and one of the things that I was really frustrated with was this complete lack of critical approach and political understanding in the field. Obviously there is a lot of excellent EdTech work being done, but this work is by and large sold as apolitical and inevitable. In a more scholarly language, EdTech is heavily dominated by instrumentalism (a view of EdTech as a politically neutral tool) and technological determinism (the idea that technology drives social development) (Jandrić and Knox 2021).

After some years in EdTech I slowly joined the critical pedagogy movement and found a disturbingly similar mirror image. I met people talking about social justice, emancipation, love, and revolution, holding hands in Freirean *circulo de cultura*, and developing critical consciousness—but without any reference to technology! And when they do mention technology, it is usually around areas such as media studies and literacies, which are just as instrumentalist (albeit a bit less technologically determinist) as EdTech.

I think that both sides are equally responsible for ignoring the other, for being very much into their own perspective, and not really being open to other perspectives. And then there are more fields that need to join the discussion, such as philosophy of technology, science and technology studies, gender studies, and many others (a good overview of 10 or so main areas can be found in Jandrić and Ford 2020).

Born out of frustration with disciplinary fragmentation of thought and practice, the postdigital perspective aims at developing theoretical perspectives, and concrete spaces and places (such as *Postdigital Science and Education* journal and book series), where all those different fields and approaches can come into dialogue, discussion, ideally even collaboration. In short, postdigital critical pedagogies, together with pretty much anything else postdigital, is all about convergence.

**MP:** You can achieve a lot with subversion of form. When we started using collective articles in *Educational Philosophy and Theory*, that came out of pragmatic concerns about publishing. There is a critical pedagogy in the subjective process of writing an article together or seeing it together or working together in some way. That was one of the starting points when Petar, Sarah, and I started talking about *Bioinformational Philosophy and Postdigital Knowledge Ecologies* (Peters et al. 2022) and the one we developed in book's Introduction and Conclusion.

Subversion of form does have limits, because it ideally has to carry an argument or a narrative and if you have more than 20 players, that starts to look differently [we explored this in detail in our latest collective article, 'Collective Writing: The Continuous Struggle for Meaning-Making' (Jandrić et al. 2022b)]. Petar's done some very large collective articles, some of which have more than 80 authors (e.g., Jandrić et al. 2020, 2021, 2022a). Marek Tesar, Liz Jackson, Tina Besley, and I did a whole book with participation from a huge number of scholars and countries (Peters et al. 2020d).

Democratic subversion of form is not easy, but it is possible, and it is a critical pedagogy in itself. Form opens new possibilities. People discover that writing for publication can be fun, that they can learn something from writing rather than



having to work under the hammer to publish yet another article for their promotion purposes. Unsurprisingly, our community's work collectively written articles, gathered around the Editors' Collective,<sup>10</sup> was resisted all the way by the publishers. Instead of budging on their resistance, however, we also developed something called the open review, where the reviewers are not hidden and they become a part of the process (see Jackson et al. 2018; Jandrić et al. 2022b).

There are principles here to do with critical approaches to academic publishing which are based on classical critical theory values and can achieve some kind of change in subjectivities and also encourage new kinds of solidarity. We have to put that in the same basket with citizen science and open science more generally and confront that against the highly specialized lab science that includes a very few people. In collective writing we are talking about innovation at the level of content, form, and ownership. As Derek says: experiment, innovate, do something different. I think that is where our skills are at, and we have a pretty good future to look forward.

**AM:** That is a good note to wrap up. There are many unresolved things that we can keep talking about, but we need to finish. Thank you everyone for coming over! It was a really interesting and pleasurable conversation.

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<sup>10</sup> See <https://editorscollective.org.nz/>. Accessed 8 July 2022.

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